GARISSA UNIVERSITY

UNIVERSITY EXAMINATION 2017/2018 ACADEMIC YEAR ONE FIRST SEMESTER EXAMINATION

SCHOOL OF EDUCATION, ARTS AND SOCIAL SCIENCES

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE

COURSE CODE: STA 111

COURSE TITLE: INTRODUCTION TO PROBABILITY AND STATISTICS I

EXAMINATION DURATION: 3 HOURS

DATE: 06/12/17 **TIME: 09.00-12.00 PM**

INSTRUCTION TO CANDIDATES

- **The examination has SIX (6) questions**
- **Question ONE (1) is COMPULSORY**
- **Choose any other THREE (3) questions from the remaining FIVE (5) questions**
- **Use sketch diagrams to illustrate your answer whenever necessary**
- **Do not carry mobile phones or any other written materials in examination room**
- **Do not write on this paper**

This paper consists of FIVE (5) printed pages ***please turn over***

QUESTION ONE (COMPULSORY)

(a) Differentiate between descriptive and inferential statistics **[2 marks]**

(b) List two advantages of conducting a sample survey instead of a census. **[2 marks]**

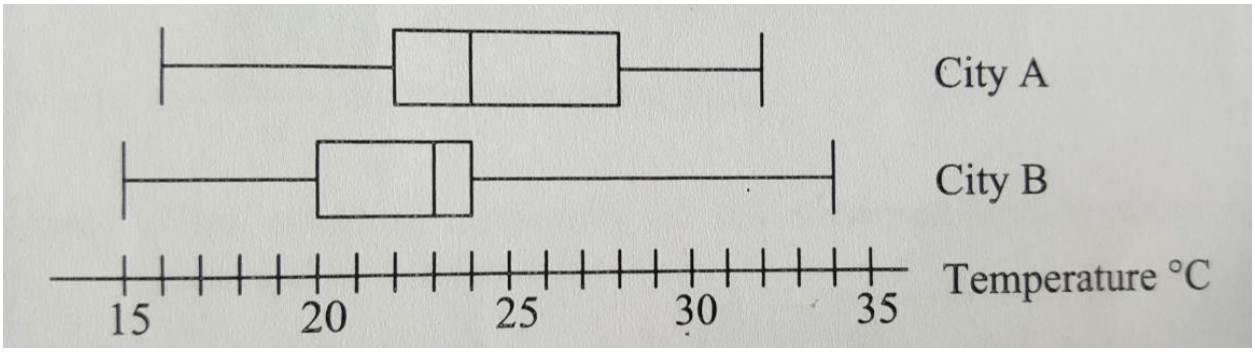
(c) Data monthly rainfall, in cm, over a period of 15 months

J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
30	35	38	45	50	56	44	34	31	37	39	29	33	36	40

Find the mode, median and the inter quartile range. **[4 marks]**

(d) In a class of 20 pupils, the mean height of 12 boys is 1.6m and the mean height of 8 girls is 1.5m. Determine the mean height of all the pupils. **[3 marks]**

(e) The following Box-and-whisker plots record the daily temperatures in the month of January at two cities some distance apart.



i. Which city recorded the highest temperatures
ii. Which city could be described as the 'hotter' of the two and why
iii. Which city recorded the greater range of temperatures
iv. Which city had had the more variable temperature **[5 marks]**

(f) 60% of all households in a city subscribe to the Star Newspaper, while 80% subscribe to the Nation and 50% subscribe to both papers. A household is selected at random. What is the probability that it subscribes to:

i. At least one of the two papers **[2 marks]**
ii. Exactly one of the two papers **[2 marks]**

(g) In a small town, the probability that a woman attends a family planning clinic is 0.4 and the probability that her husband attends the clinic is 0.1. The probability that a husband attends the clinic given that his wife does is 0.8. Find the probability that

i. both husband and wife attend clinic **[1 mark]**
ii. the wife will attend the clinic given that the husband does **[2 marks]**
iii. at least one of the two persons attends clinic **[2 marks]**

QUESTION TWO

(a) Distinguish between the following terms as used in statistics **[6 marks]**

i. Primary data and Secondary data

ii. A parameter and a statistic

iii. Skewness and kurtosis

(b) Distinguish between simple random sampling and systematic random sampling. **[2 marks]**

(c) Pearson's measure of skewness of a distribution is 0.5. Its mean and median are 42 and 36 respectively. Find the coefficient of variation **[3 marks]**

(d) Consider the following

Group One: 17, 19, 39, 20, 27, 26, 27

Group Two: 7, 33, 17, 27, 15, 22, 31

Construct box plots of the distributions of the two groups on the same grid **[4 marks]**

QUESTION THREE

One hundred (100) closing prices on the National Stock Exchange (NSE) resulted in the distribution given below. The prices are rounded to the nearest dollar.

Class	20 - 25	25 - 30	30 – 35	35 - 40	40 - 45	45 - 50	50 - 55
Frequency	2	8	9	19	26	20	16

Determine the

i. Mean using 37.5 as assumed mean **[3 marks]**

ii. Median **[3 marks]**

iii. Mode **[3 marks]**

iv. Standard deviation **[4 marks]**

v. Coefficient of variation **[2 marks]**

QUESTION FOUR

(a) Two machines A and B produce 60% and 50% respectively of the total output of a factory. Of the parts produced by machine A, 3% are defective and of the parts introduced by machine B, 5% are defective. Apart is selected at random from a day's production and found to be defective. What is the probability that it came from machine A **[6 marks]**

(b) Suppose events A and B are such that:

$p(A) = \frac{1}{3}, p(B) = \frac{1}{3}$ and $p(A \cup B) = \frac{2}{5}$,

Determine $p(A \cap B)$. Are A and B independent? **[4 marks]**

(c) The mean mass of 150 students in a class is 60kg.The mean mass of boys is 70kg, and that of girls is 55kg. Find the number of boys and the number of girls in this class **[5 marks]**

QUESTION FIVE

A director of a multinational company gave a written interview to100 candidates. The marks scored, out of 100, were distributed as shown below

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	4	16	27	32	15	4	2

Find

i. The mean and standard deviation **[6 marks]**

ii. The 80^{th} percentile **[2 marks]**

iii. The pass mark if 30 % of the candidates were to fail **[2 marks]**

iv. The minimum number of marks required to obtain grade A if only 5 candidates were to get A **[2 marks]**

v. How many candidates were to pass if the pass mark was set at 25 marks **[3 marks]**

QUESTION SIX

(a) What is regression analysis? **[2 marks]**

(b) Explain each term in the linear regression model,

$$y_{i=a+bx_i+e_i}$$ **[2 marks]**

(c) Define the coefficient of determination in terms of coefficient of correlation (r). What is the interpretation of a given value of coefficient of determination **[3 marks]**

(d) The data below shows the scores obtained by ten students in a statistics class in the mid-term and final examination.

Student	1	2	3	4	5	6	7	8	9	10
Mid-term (x)	98	66	100	96	88	45	76	60	74	82
Final (y)	90	74	98	88	80	62	78	74	86	80

i. Determine the least-squares regression line which may be used to predict final examination scores from the mid-term score. **[6 marks]**

ii. Estimate the final examination score for a student with a score of 70 in the mid-term. **[2 marks]**